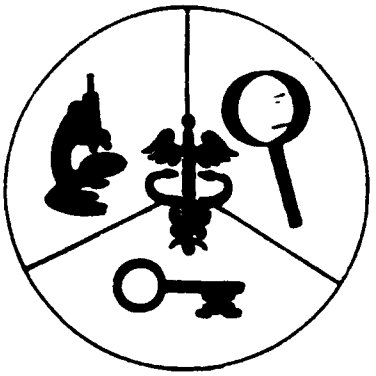
AD-A284 035



DIRECTORATE OF
HEALTH CARE STUDIES
AND ANALYSES

DTIC
ELECTE
SEP 01 1994
S D
G

PRODUCTIVITY AS DETERMINED BY CONFIGURATION

94-28370

DR 94-001

March 1994

UNITED STATES ARMY
MEDICAL DEPARTMENT CENTER AND SCHOOL
FORT SAM HOUSTON, TEXAS 78234-6100

94 8 31 141

DTIC QUALITY INSPECTED 8

NOTICE

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

Accesion For	
NTIS CRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution /	
Availability Codes	
Dist	Avail and / or Special
A-1	

* *

Regular users of services of the Defense Technical Information Center (per DOD Instruction 5200.21) may purchase copies directly from the following:

Defense Technical Information Center (DTIC)
ATTN: DTIC-DDR
Cameron Station
Alexandria, VA 22304-6145

Telephones: DSN 284-7633, 4 or 5
COMMERCIAL (703) 274-7633, 4, or 5

All other requests for these reports will be directed to the following:

U.S. Department of Commerce
National Technical Information Services (NTIS)
5285 Port Royal Road
Springfield, VA 22161

Telephone: COMMERCIAL (703) 487-4650

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Distribution unlimited; Available for public use.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) DR 94-001	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION Center for Healthcare Education & Studies 6b. OFFICE SYMBOL (If applicable) HSHN-H	7a. NAME OF MONITORING ORGANIZATION AMEDDC&S
6c. ADDRESS (City, State, and ZIP Code) Bldg 2268 Fort Sam Houston,TX 78234-6125	7b. ADDRESS (City, State, and ZIP Code) Fort Sam Houston, TX 78234-6100
8a. NAME OF FUNDING/SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) (U) Productivity as Determined by Configuration	
12. PERSONAL AUTHOR(S) LTC James A. Lalumandier, Sherry Riddle, Dr. Barbara Wojcik	
13a. TYPE OF REPORT Final	13b. TIME COVERED FROM Oct 91 TO Mar 94
14. DATE OF REPORT (Year, Month, Day) 30 March 1994	15. PAGE COUNT 30
16. SUPPLEMENTARY NOTATION	

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	
			Productivity, Configuration

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

(U) A productivity study was conducted to determine the change in productivity when dentists work in different combinations of configurations and to determine which specific configuration yields the highest productivity. Twenty-eight of the 37 dental activities in the U.S. Army Health Services Command participated in the survey. The most productive configuration examined consisted of three operatories and two assistants. The results also showed that dentists are more productive when confined to one configuration. However, in practice, dentists often work in more than one configuration and less than 4% of total chairside time is spent in the most effective configuration.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION Unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL LTC James A. Lalumandier	22b. TELEPHONE (Include Area Code) (210) 221-0047 22c. OFFICE SYMBOL HSHN-H

DD Form 1473, JUN 86 *Previous editions are obsolete.* SECURITY CLASSIFICATION OF THIS PAGE
Unclassified

TABLE OF CONTENTS

Page

DISCLAIMER i

REPORT DOCUMENTATION PAGE (DD 1473) ii

TABLE OF CONTENTS iii

EXECUTIVE SUMMARY iv

BACKGROUND 1

METHODS 3

RESULTS 6

DISCUSSION 9

CONCLUSION 13

REFERENCES 14

TABLES 16

Table 1: Mean Productivity for Dentists Working in Configurations Without EFDAs 17

Table 2: Results of T-tests Comparing Mean Productivity of Dentists in Any One Configuration to the Mean Productivity of Dentists Working in More Than One Configuration 18

Table 3: Summary Productivity Statistics by Configuration on Dentists Who Worked in Only One Configuration 100% of the Time 19

Table 4: Results of T-tests Comparing the Mean Productivity of Dentists Using Only Configuration 3 to the Mean Productivity of Dentists Using Only Configuration 23 20

Table 5: Total Hours and Percentage of Chairside Time All Dentists Spent in Each Configuration 21

APPENDICES 22

DISTRIBUTION 26

EXECUTIVE SUMMARY

A productivity study was conducted to determine the change in productivity when dentists work in different combinations of configurations and to determine which specific configuration yields the highest productivity. Twenty-eight of the 37 dental activities in the U.S. Army Health Services Command participated in the survey. The most productive configuration examined consisted of three operatories and two assistants. The results also showed that dentists are more productive when confined to one configuration. However, in practice, dentists often work in more than one configuration and less than 4% of total chairside time is spent in the most effective configuration.

BACKGROUND

Productivity is an important aspect of the Dental Care System enabling dental care personnel to serve as many soldiers and beneficiaries as possible while maintaining the highest quality of care. Two possible ways of accomplishing this task without increasing the number of dentists would be to increase the number of work areas (operatories) and/or to increase the number of workers (e.g., dental assistants). As early as 1944, Henry Klein published the results of a survey which described the effect of chairside assistants on the productivity of the dentist. Depending on the mix of the number of chairs with one assistant, productivity could be increased from 33% to 75%. Law (1953, 1955) and Waterman (1953, 1954) in 1945 and 1946, respectively, demonstrated that the optimal mix for the best results was one dentist with two chairs and two assistants, one chairside and one roving.

As the population and general economy grew after World War II, dentistry flourished during the "golden age" of the 1950s. By the 1960s there was a real concern that we lacked sufficient dental manpower to treat those seeking dental care. The passage of the Health Professions Education Assistance Act in 1963 brought the federal funds to build new dental schools, revitalize existing schools, and financially aid dental students. During the next 15 to 20 years, research into increasing production also flourished in the area of practice configuration; that is, the

number of operatories, dental assistants, and expanded function dental auxiliaries (EFDA). A 1967-1970 nationwide survey (Bureau of Health Manpower, 1977) of nearly 40,000 general dentists found those not employing dental auxiliaries and those in the older groups had a productivity equivalence significantly below that of fully-active dentists in their most productive years. While only one-fifth of those dentists surveyed employed no auxiliaries, more than half the dentists were 55 or more years of age. While the average number of operatories was reported as 2.3, the utilization increased from 1.4 for dentists with no auxiliaries to 3.4 operatories with four or more auxiliaries.

The purposes of this study were (a) to determine the change in productivity when working in different combinations of configurations and (b) to determine which specific configuration yielded the highest productivity.

METHODS

Surveys were sent to U.S. Army Health Services Command dentists stationed in the U.S. and Panama at 28 of the 37 dental activities. Survey participants were asked to indicate the percentage of time they spent practicing in 30 possible configurations during the month of November 1991. A configuration is the number of operatories, dental assistants, and EFDAs a dentist works with. EFDAs are expanded dental assistants with one year of additional training from the Army. Their job responsibilities include performing any reversible dental procedure. Since EFDAs are being phased out, only those dentists who did not work with an EFDA during the survey period were considered. This criterion reduced the number of possible practice configurations to 10.

Configuration 1: 1 operatory / 0 assistants / 0 EFDAs

Configuration 3: 1 operatory / 1 assistant / 0 EFDAs

Configuration 5: 1 operatory / 2 assistants / 0 EFDAs

Configuration 7: 2 operatories / 0 assistants / 0 EFDAs

Configuration 10: 2 operatories / 1 assistant / 0 EFDAs

Configuration 13: 2 operatories / 2 assistants / 0 EFDAs

Configuration 15: 3 operatories / 0 assistants / 0 EFDAs

Configuration 19: 3 operatories / 1 assistant / 0 EFDAs

Configuracion 23: 3 operatories / 2 assistants / 0 EFDAs

Configuration 27: 3 operatories / 3 assistants / 0 EFDAs

Parker (1979) found that productivity, as defined by the U.S. Army Dental Corps, is measured by a weighted work unit (WWU) which is based on the amount of time it takes to perform different dental procedures. More time consuming procedures are assigned higher WWUs. One WWU is equal to the approximate amount of time it takes an average dentist to complete one occlusal amalgam restoration. Each dentist reports daily WWUs to administrative personnel in the clinics who enter the data into an automated data base. These administrative personnel retrieved the data and reported WWU information for the survey period. Survey participants reported the number of hours spent chairside (providing direct patient care) for each day in the survey period. WWUs and hours treating patients were reported for every day in November 1991 except weekends and holidays, for a maximum of 19 work days.

Each provider's productivity was then measured by his/her total WWUs divided by his/her total chairside hours. This technique ensured all dentists were comparable to the same scale by using the average WWUs earned per hour working chairside during the survey period. The average WWUs are referred to as productivity throughout this report.

In order to evaluate the change in productivity when dentists work in different combinations of configurations, the data was split into two groups: (a) Group 1 included dentists working in only one configuration the entire survey period, and (b) Group 2 included dentists working in a combination of two or

more configurations during the survey period. Furthermore, to analyze trends in the data, the dentists with the highest productivity were examined further. Comparisons were made between all dentists and the top 50%, top 25%, top 10%, and top 5% of the dentists. Top percentages were taken from the original group of dentists working in configurations without EFDAs, then Group 1 and Group 2 were split out.

The second part of this report examined which specific configuration yielded the highest productivity. For this analysis it was necessary to associate each dentist with one configuration. Therefore, we studied the dentists only in Group 1 because they worked in only one configuration. Again, we analyzed trends by making comparisons between all providers in Group 1 and the top 50%, 25%, 10%, and 5% of all providers in Group 1. These subsets were further split by configuration.

RESULTS

Sample Results

Of the 513 surveys sent to general dentists within the Army Dental Care System, 410 responded. The response rate was 79.9%. However, with EFDAs being phased out, the 146 respondents who had worked with these expanded dental assistants were removed from the original data set. Also, one outlier was removed from the data, reducing the sample to 263 dentists. Likewise, the number of configurations were reduced to nine because configuration number 15 had zero observations.

Productivity Analysis: Best Combination of Configurations

Productivity was used to find the most effective configuration practice. A detailed analysis was performed for the sample of 263 dentists and for the top 50%, 25%, 10%, and 5% based on productivity. The results are presented in Table 1. This table shows a trend for higher productivity when the dentists work in only one configuration the entire survey period (Group 1) as opposed to working in a combination of two or more configurations during the same period (Group 2). This isn't true for the entire data set, but does hold for the top 50%, top 25%, top 10% and top 5% of providers. Group 1 dentists showed a 6.16% increase in productivity over Group 2 dentists when scored in the top 50% of providers, a 7.96% gain when included with the top 25% of the dentists sorted by their productivity, a 7.36% increase if

they're in the top 10%, and a 12.20% improvement in productivity when in the top 5% of providers. However, for all observations in the sample there was a .72% decrease in the productivity of Group 1 dentists compared to Group 2 dentists.

Table 2 shows the results of the t-test procedure used to examine differences in productivity of Group 1 providers versus Group 2 providers. The summary statistics suggested higher mean productivity values for the Group 1 dentists, but the results of the t-test didn't support this hypothesis. Since p-values were higher than the significance level alpha = 0.05, we failed to reject the null hypothesis that the mean productivity values were equal. We concluded there were no statistical differences between Group 1 and Group 2 means.

Productivity Analysis: Best Configuration

Table 3 presents the summary statistics by configuration when the provider worked in Group 1 (i.e., in exclusively one of nine possible configurations throughout the survey). Group 1 dentists used only six of the nine configurations available. The top 5% of dentists working in Group 1 used one of only two configurations: configuration 3 (one operatory, one assistant, zero EFDAs) or configuration 23 (three operatories, two assistants, zero EFDAs). In the top 10% of providers, two additional configurations were used, but only one dentist used each. Since configurations 3 and 23 were used by a majority of the top producers, these configurations were studied further.

For the top 5% of providers, practicing in configuration 23 instead of configuration 3 yielded a 6.72% increase in productivity. For the top 10%, a 3.10% increase in productivity was noted for providers using configuration 23, and there was a 16.49% increase for providers in the top 25%. For providers in the top 50%, using configuration 23 resulted in a 37.22% increase in productivity. For the sample of 166 providers in Group 1, there was a 60.65% increase in productivity for providers using configuration 23 instead of configuration 3.

Table 4 presents the results of the Student's t-test for testing the difference between mean productivity of dentists working in configuration 3 and configuration 23. For alpha = 0.05, no significant differences were found between the mean productivity for the top 5%, 10%, and 25% of providers. However, significant differences were observed for the top 50% and 100% of dentists ($p = 0.0095$ for the top 50% and $p = 0.0001$ for all providers). The t-test comparing means for the top 50% of producers had a power of over 70% (0.7054) (harmonic mean $n^* = 9$, significance level alpha = 0.05, computed effect size d = 1.26) and the power analysis of the t-test for all providers gave very optimistic results with the power equal to almost 96% (0.9582) (harmonic mean $n^* = 11$, significance level alpha = 0.05, computed effect size d = 1.66). This led to the conclusion that practicing in configuration 23 was more effective in improving productivity than practicing in configuration 3.

DISCUSSION

Productivity Analysis: Best Combination of Configurations

The non-significant t-test results shown in Table 2 may have been caused by inadequate power because the sample size was too small to detect existing differences between the two groups. A solution was to increase the sample size of dentists. This would allow us to approach an 80% power level for a two-tailed t-test. If power = 0.80, significance level alpha = 0.05, and effect size d = 0.20, then the desired sample size can be found in Cohen's tables (1988). Given these assumptions, about 800 dentists should be examined: 400 dentists in Group 1 and 400 dentists in Group 2.

The effect size was the effect that practicing within either group had on productivity. That is, if the productivity means of the groups were equal (i.e., the null hypothesis is true), the effect size was zero. An effect size of d = 0.20 is suggested when the area of research is new and the instruments used in the survey have not been well tested. The effect size is defined as follows:

$$d = | m_1 - m_2 | / \sigma$$

where d is the effect size for t-test of means,

m_1 and m_2 are population means, and

σ is the common standard deviation.

Since we assumed equality of variances ($\sigma_1^2 = \sigma_2^2$), the best estimate of the common standard deviation is calculated as

follows:

$$\hat{\sigma} = \sqrt{\{(n_1-1)s_1^2 + (n_2-1)s_2^2\} / (n_1+n_2-2)}$$

where $\hat{\sigma}$ is the estimate of the common standard deviation,

n_1 and n_2 are sample sizes, and

s_1^2 and s_2^2 are sample variances.

For the top 10% of dentists, the effect size was found from the following expressions:

$$\hat{\sigma}^2 = \{(18-1)(3.178)^2 + (8-1)(1.602)^2\} / (18+8-2) = 7.90$$

$$\hat{\sigma} = 2.81$$

$$d = (13.4123-12.4933) / 2.81 = 0.33$$

In the top 10% of providers, there were 18 dentists in Group 1 and 8 dentists in Group 2. The harmonic mean was computed (Cohen) to evaluate the power of the t-test. This mean was found from the following formula:

$$n^* = 2n_1n_2 / (n_1 + n_2) = 2(18)(8) / (18 + 8) = 11$$

where n^* is the harmonic mean, and

n_1 and n_2 are sample sizes.

For the sample size $n^* = 11$, effect size $d = 0.33$, and significance level alpha = 0.05, the approximate power of the t-test was 0.11. This value was much lower than the 0.80 power level accepted by statisticians as "good." The probability of rejecting the null hypothesis (that the mean productivities for Group 1 and Group 2 were equal) when it was false, was only equal to 0.11. To increase the power of the Student's t-test, the analysis of the providers' productivity should be repeated for a

larger sample of dentists. To find the recommended sample size when the calculated effect size is not available in an existing table, use the following formula (Portney & Watkins, 1993):

$$n = \{n_{0.10} \ / \ 100(d)^2\} + 1$$

where $n_{0.10}$ is the sample size given for the effect size d = 0.10, alpha = 0.05, power = 0.80, and d is the exact calculated value of the effect size.

For the top 10% of providers, the recommended sample size was calculated as follows:

$$n = \{1571 \ / \ 100(0.33)^2\} + 1 = 144.3 + 1 \approx 146$$

When d = 0.33, we need approximately 146 dentists in each of the two groups examined to be able to find a significant difference between their means.

Productivity Analysis: Best Configuration

For the top 5% of providers, the power of the t-test results presented in Table 4 was about 5%. The exact value of power was computed from the following expression and the probability for the given percentile $z_{1-\beta}$ can be found in any Normal Curve Area Tables (Cohen):

$$z_{1-\beta} = \left\{ \frac{d(n^*-1)\sqrt{2n^*}}{2(n^*-1) + 1.21(z_{1-\alpha_1} - 1.06)} \right\} - z_{1-\alpha_1}$$

where $z_{1-\beta}$ is the percentile of the standard normal distribution used to get the power value,

$Z_{1-\alpha_1}$ is the percentile of the standard normal distribution,

α_1 is the two-sided significance level alpha divided by two,

d is the effect size, and

n^* is the harmonic mean.

For the top 5% of producers, when d = 0.31, n^* = 3, and alpha = 0.05, the value $Z_{1-\beta}$ was calculated as follows:

$$Z_{1-\beta} = \left\{ \frac{(0.31)(2)\sqrt{2(3)}}{(2)(2)+1.21(1.96-1.06)} \right\} - 1.96 = -1.66$$

Power for this value of percentile was equal to 0.0485.

To get a desirable power (0.80), when d = 0.31 and alpha = 0.05, the recommended sample size was 165 dentists working in configuration 3 and 165 dentists working in configuration 23.

CONCLUSION

This study showed that the most productive configuration examined consisted of three operatories with two assistants and that dentists can be even more productive by working in only one configuration. However, the most effective configuration (3 operatories and 2 assistants) was actually used less than 4% of the total chairside time. One of the least efficient configurations (1 operatory and 1 assistant) was used more than 63% of the total chairside time (Table 5). By increasing time dentists work in configuration 23, the total productivity should increase substantially.

REFERENCES

Bureau of Health Manpower. (1977). Auxiliaries Per Dentist in Relation to Certain Dental Practice Characteristics (Report No. 78-7). Hyattsville, MD: Department of Health, Education, and Welfare.

Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences. Hillsdale, NJ: Lawrence Erlbaum Associates.

Klein, H. (1944). Civilian dentistry in wartime. Journal of American Dental Association, 31, 648-61.

Law, F.E., Johnson, C.E., & Knutson, J.W. (1953). Studies on dental care services for school children: First and second treatment series at Woonsocket, Rhode Island. Public Health Reports, 68, 1192.

Law, F.E., Johnson, C.E., & Knutson, J.W. (1955). Studies on dental care services for school children: Third and fourth treatment series at Woonsocket, Rhode Island. Public Health Reports, 70, 402.

Parker, W.A. (1979). Dental Care Composite Unit Study (HCSD Report No. 78-006X). Fort Sam Houston, TX: U.S. Army Health Services Command, Dental Studies Division.

Portney, L.G., & Watkins, M.P. (1993). Foundations of Clinical Research, Applications to Practice. Norwalk, CT: Appleton & Lange.

Waterman, G.E., & Knutson, J.W. (1953). Studies on dental care services for school children: First and second treatment series at Richmond, Indiana. Public Health Reports, 68, 583.

Waterman, G.E., & Knutson, J.W. (1954). Studies on dental care services for school children: Third and fourth treatment series at Richmond, Indiana. Public Health Reports, 69, 247.

TABLES

TABLE 1

MEAN PRODUCTIVITY FOR DENTISTS
WORKING IN CONFIGURATIONS WITHOUT EFDAs

Case	Group[a]	n	Mean Productivity[b]	Standard Deviation	Change in Productivity[c]
All Dentists	1	166	7.746	2.645	-0.72%
	2	97	7.802	2.050	
	all	263	7.767	2.439	
Top 50%	1	77	9.665	2.680	6.16%
	2	55	9.104	1.744	
	all	132	9.431	2.345	
Top 25%	1	40	11.252	2.912	7.96%
	2	26	10.422	1.727	
	all	66	10.925	2.530	
Top 10%	1	18	13.412	3.178	7.36%
	2	8	12.493	1.602	
	all	26	13.130	2.788	
Top 5%	1	9	15.628	3.173	12.20%
	2	4	13.929	0.507	
	all	13	15.105	2.728	

Notes:
[a] Group 1 dentists worked in only one configuration 100% of the time. Group 2 dentists worked in any other combination of configurations
[b] Productivity is based on the average number of weighted work units per chairside hour for the survey period.
[c] Percentage of productivity increase/decrease is based on the change from Group 2 to Group 1 and is calculated as follows:

$$\left\{ \frac{\text{(Group 1 mean productivity) - (Group 2 mean productivity)}}{\text{(Group 2 mean productivity)}} \right\} \times 100$$

TABLE 2

RESULTS OF T-TESTS COMPARING MEAN PRODUCTIVITY OF DENTISTS IN ANY ONE CONFIGURATION TO THE MEAN PRODUCTIVITY OF DENTISTS WORKING IN MORE THAN ONE CONFIGURATION

Case	Group[a]	n	Mean Productivity[b]	t Statistic	P Value
All Dentists	1	166	7.746	-0.1934	.8468
	2	97	7.802		
Top 50%	1	77	9.665	1.4561	.1478
	2	55	9.104		
Top 25%	1	40	11.252	1.4532	.1511
	2	26	10.422		
Top 10%	1	18	13.412	0.7694	.4492
	2	8	12.493		
Top 5%	1	9	15.628	1.5617	.1533
	2	4	13.929		

Notes:
[a] Group 1 dentists worked in only one configuration 100% of the time. Group 2 dentists worked in any other combination of configurations.
[b] Productivity is based on the average number of weighted work units per chairside hour for the survey period.

TABLE 3

SUMMARY PRODUCTIVITY STATISTICS BY CONFIGURATION ON DENTISTS WHO WORKED IN ONLY ONE CONFIGURATION 100% OF THE TIME

Cases	Configuration[a]	n	Mean Productivity[b]	Standard Deviation
All Dentists	1 op/0 ast/0 EFDA	4	7.760	3.075
	1 op/1 ast/0 EFDA	115	7.596	2.697
	2 op/1 ast/0 EFDA	39	7.488	1.454
	2 op/2 ast/0 EFDA	1	9.574	.
	3 op/1 ast/0 EFDA	1	6.417	.
	3 op/2 ast/0 EFDA	6	12.203	4.169
	all	166	7.746	2.645
Top 50%	1 op/0 ast/0 EFDA	1	12.353	.
	1 op/1 ast/0 EFDA	50	9.681	2.785
	2 op/1 ast/0 EFDA	20	8.590	0.977
	2 op/2 ast/0 EFDA	1	9.574	.
	3 op/2 ast/0 EFDA	5	13.284	3.599
	all	77	9.665	2.680
Top 25%	1 op/0 ast/0 EFDA	1	12.353	.
	1 op/1 ast/0 EFDA	25	11.404	3.080
	2 op/1 ast/0 EFDA	8	9.581	0.712
	2 op/2 ast/0 EFDA	1	9.574	.
	3 op/2 ast/0 EFDA	5	13.284	3.599
	all	40	11.252	2.912
Top 10%	1 op/0 ast/0 EFDA	1	12.353	.
	1 op/1 ast/0 EFDA	12	13.537	3.297
	2 op/1 ast/0 EFDA	1	10.791	.
	3 op/2 ast/0 EFDA	4	13.957	3.775
	all	18	13.412	3.178
Top 5%	1 op/1 ast/0 EFDA	7	15.398	3.181
	3 op/2 ast/0 EFDA	2	16.432	4.260
	all	9	15.628	3.173

Notes:
[a] A configuration is the number of operatories, dental assistants, and Expanded Function Dental Auxiliaries a dentist works with.
[b] Productivity is based on the average number of weighted work units per chairside hour for the survey period.

TABLE 4

RESULTS OF T-TESTS COMPARING THE MEAN PRODUCTIVITY OF DENTISTS USING ONLY CONFI RATION 3 TO THE MEAN PRODUCTIVITY OF DENTISTS USING ONLY CONFIGURATION 23[a]

Case	Configuration[a]	n	Mean Productivity[b]	t Statistic	P Value
All Dentists	3	115	7.596	-3.9650	.0001
	23	6	12.203		
Top 50%	3	50	9.681	-2.6906	.0095
	23	5	13.284		
Top 25%	3	25	11.404	-1.2143	.2348
	23	5	13.284		
Top 10%	3	12	13.537	-0.2135	.8340
	23	4	13.957		
Top 5%	3	7	15.398	-0.3840	.7124
	23	4	16.432		

Notes:
[a] A configuration is the number of operatories, dental assistants, and expanded function dental auxiliaries (EFDAs) a dentist works with. Configuration 3 is one operatory, one dental assistant, and zero EFDAs. Configuration 23 is three operatories, two dental assistants, and zero EFDAs.
[b] Productivity is based on the average number of weighted work units per chairside hour for the survey period.

TABLE 5

TOTAL HOURS AND PERCENTAGE OF CHAIRSIDE TIME
ALL DENTISTS SPENT IN EACH CONFIGURATION

Config Number	Configuration[a]	Total Hours	Percentage of Chairside Time
1	1 op/0 ast/0 EFDA	694.57	2.6939
3	1 op/1 ast/0 EFDA	16,387.42	63.5590
5	1 op/2 ast/0 EFDA	44.70	0.1734
7	2 op/0 ast/0 EFDA	91.40	0.3545
10	2 op/1 ast/0 EFDA	6,845.82	26.5517
13	2 op/2 ast/0 EFDA	587.67	2.2793
19	3 op/1 ast/0 EFDA	224.64	0.8713
23	3 op/2 ast/0 EFDA	902.03	3.4985
27	3 op/3 ast/0 EFDA	3.75	0.0145
	TOTAL	25,782.00	99.9961[b]

Notes:
[a] A configuration is the number of operatories, dental assistants, and expanded function dental auxiliaries (EFDAs) a dentist works with.
[b] Sum of percentages does not equal 100 due to rounding errors.

APPENDICES

CODING AND DESCRIPTION OF QUESTIONNAIRE VARIABLES

Var Name	Definition	Code
PROVID	Provider identification	A2032 - Z4349
CHRTOTAL	Total chairside hours	005 - 149
WWUTOTAL	Total Weighted Work Units	0033.0 - 2799.9
WWUAVG	Average Weighted Work Units per chairside hour - productivity WWUAVG=WWUTOTAL/CHRTOTAL	03.067 - 21.354
CONF1	percentage of time spent with 1 operatory / 0 assistants / 0 EFDAs	000 - 100
CONF2	percentage of time spent with 1 operatory / 0 assistants / 1 EFDA	0
CONF3	percentage of time spent with 1 operatory / 1 assistant / 0 EFDAs	000 - 100
CONF4	percentage of time spent with 1 operatory / 1 assistant / 1 EFDA	0
CONF5	percentage of time spent with 1 operatory / 2 assistants / 0 EFDAs	00 - 10
CONF6	percentage of time spent with 1 operatory / 2 assistants / 1 EFDA	0
CONF7	percentage of time spent with 2 operatories / 0 assistants / 0 EFDAs	00 - 30
CONF8	percentage of time spent with 2 operatories / 0 assistants / 1 EFDA	0
CONF9	percentage of time spent with 2 operatories / 0 assistants / 2 EFDAs	0
CONF10	percentage of time spent with 2 operatories / 1 assistant / 0 EFDAs	000 - 100
CONF11	percentage of time spent with 2 operatories / 1 assistant / 1 EFDA	0
CONF12	percentage of time spent with 2 operatories / 1 assistant / 2 EFDAs	0
CONF13	percentage of time spent with 2 operatories / 2 assistants / 0 EFDAs	000 - 100

CONF14	percentage of time spent with 2 operatories / 2 assistants / 1 EFDA	0
CONF15	percentage of time spent with 3 operatories / 0 assistants / 0 EFDAs	0
CONF16	percentage of time spent with 3 operatories / 0 assistants / 1 EFDA	0
CONF17	percentage of time spent with 3 operatories / 0 assistants / 2 EFDAs	0
CONF18	percentage of time spent with 3 operatories / 0 assistants / 3 EFDAs	0
CONF19	percentage of time spent with 3 operatories / 1 assistant / 0 EFDAs	000 - 100
CONF20	percentage of time spent with 3 operatories / 1 assistant / 1 EFDA	0
CONF21	percentage of time spent with 3 operatories / 1 assistant / 2 EFDAs	0
CONF22	percentage of time spent with 3 operatories / 1 assistant / 3 EFDAs	0
CONF23	percentage of time spent with 3 operatories / 2 assistants / 0 EFDAs	000 - 100
CONF24	percentage of time spent with 3 operatories / 2 assistants / 1 EFDA	0
CONF25	percentage of time spent with 3 operatories / 2 assistants / 2 EFDAs	0
CONF26	percentage of time spent with 3 operatories / 2 assistants / 3 EFDAs	0
CONF27	percentage of time spent with 3 operatories / 3 assistants / 0 EFDAs	0 - 5
CONF28	percentage of time spent with 3 operatories / 3 assistants / 1 EFDA	0
CONF29	percentage of time spent with 3 operatories / 3 assistants / 2 EFDAs	0
CONF30	percentage of time spent with 3 operatories / 3 assistants / 3 EFDAs	0

YREXPER	Years of experience	00 - 40
DENTAC	Dental activity - location where the dentist worked	01 - 29

DISTRIBUTION:
Chief, U.S. Army Dental Corps, ATTN: DASG-DC, Bldg 5, Rm 629, 5109 Leesburg Pike, Falls Church, VA 22041-3258 (1)
Commander, U.S. Army Institute of Dental Research (USAIDR), Walter Reed Army Medical Center, Washington, DC 20307-5300 (1)
Chief, Dental Science Division, ATTN: HSHA-MD, Bldg 2841, Rm 1348, Fort Sam Houston, TX 78234-6100 (1)
Deputy Director Combat Developments, ATTN: HSHA-C, Bldg 2000, Fort Sam Houston, TX 78234-6100 (1)
Command Dental Surgeon, U.S. Army Forces Command, ATTN: FCMD-DC, Fort McPherson, GA 30330-6000 (1)
Commander, U.S. Army Dental Command (Provisional), Rm 121, Fort Sam Houston, TX 78234-6000 (1)
Deputy Commander, HQs 7th Medical Command, APO AE 09102-3304 (1)
Assistant Chief of Staff for Dental Services, HQs 7th Medical Command, APO AE 09102-33045 (1)
Defense Technical Information Center, ATTN: DTIC-OCC (Selection), Bldg 5, Cameron Station, Alexandria, VA 22304-6145 (2)
Director, Joint Medical Library, DASG-AAFJML, Offices of The Surgeons General, Army/Air Force, Rm 670, 5109 Leesburg Pike, Falls Church, VA 22041-3258 (1)
Defense Logistics Studies Information Exchange, U.S. Army Logistics Management College, Fort Lee, VA 23801-8043 (1)
Commander, U.S. Army Dental Activity, Fort Wainright, AK 99703-7300 (1)
Commander, U.S. Army Dental Activity, Fort Belvoir, VA 22060-5166 (1)
Commander, U.S. Army Dental Activity, Fort Benning, GA 31905-6100 (1)
Commander, U.S. Army Dental Activity, Fort Bliss, TX 79920-5001 (1)
Commander, U.S. Army Dental Activity, Fort Bragg, NC 28307-5000 (1)
Commander, 257th Medical Detachment (HA), Fort Bragg, NC 28307-5000 (1)
Commander, U.S. Army Dental Activity, Fort Campbell, KY 42223-1498 (1)
Commander, U.S. Army Dental Activity, Fort Carson, CO 80913-5000 (1)
Commander, U.S. Army Dental Activity, Fort Devens, MA 04133-6401 (1)
Commander, U.S. Army Dental Activity, Fort Dix, NJ 08640-6850 (1)
Commander, U.S. Army Dental Activity, Fort Drum, NY 13602-5005 (1)
Commander, U.S. Army Dental Activity, Fort Eustis, VA 23604-5569 (1)
Commander, U.S. Army Dental Activity, Fitzsimons, Aurora, CO 80045-7000 (1)
Commander, U.S. Army Dental Activity, Fort Gordon, GA 30905-5660 (1)
Commander, U.S. Army Dental Activity Hawaii, Tripler Army Medical Center, Honolulu, HI 96859-5000 (1)

DISTRIBUTION: (CONT)
Commander, U.S. Army Dental Activity, Fort Hood, TX 76544-5063 (1)
Commander, U.S. Army Dental Activity, Fort Huachuca, AZ 85613-7040 (1)
Commander, U.S. Army Dental Activity, Fort Irwin, CA 92310-5065 (1)
Commander, U.S. Army Dental Activity, Fort Jackson, SC 29207-5780 (1)
Commander, U.S. Army Dental Activity, Fort Knox, KY 40121-5520 (1)
Commander, U.S. Army Dental Activity, Fort Leavenworth, KS 66027-5410 (1)
Commander, U.S. Army Dental Activity, Fort Lee, VA 28301-5270 (1)
Commander, U.S. Army Dental Activity, Fort Leonard Wood, MO 65473-5575 (1)
Commander, U.S. Army Dental Activity, Fort Lewis, WA 98431-5020 (1)
Commander, U.S. Army Dental Activity, Fort McClellan, AL 36205-5082 (1)
Commander, U.S. Army Dental Activity, Fort Meade, MD 20755-5700 (1)
Commander, U.S. Army Dental Activity, Fort Monmouth, NJ 07703-5504 (1)
Commander, U.S. Army Dental Activity, Fort Ord, CA 93941-5000 (1)
Commander, U.S. Army Dental Activity Panama, APO Miami 34004 (1)
Commander, U.S. Army Dental Activity, Fort Polk, LA 71459-6050 (1)
Commander, U.S. Army Dental Activity, Presidio of San Francisco, CA 94129-6700 (1)
Commander, U.S. Army Dental Activity, Redstone Arsenal, AL 35809-7000 (1)
Commander, U.S. Army Dental Activity, Fort Riley, KS 66442-5043 (1)
Commander, U.S. Army Dental Activity, Fort Rucker, AL 36362-5350 (1)
Commander, U.S. Army Dental Activity, Fort Sam Houston, TX 78234-6200 (1)
Commander, U.S. Army Dental Activity, Fort Stewart, GA 31314-5225 (1)
Commander, U.S. Army Dental Activity, Walter Reed Army Medical Center, Washington, DC 20307-5400 (1)
Commander, U.S. Army Dental Activity, West Point, NY 10996-1782 (1)
Commander, 10th Medical Detachment, APO AP 96301-0022 (1)
Commander, U.S. Army Dental Activity-Japan, APO AP 96343-0078 (1)